

WHAT IS CLAIMED IS:

1. An internal combustion engine, comprising:
 - an engine housing;
 - a crankshaft, connecting rod, and piston assembly disposed within said engine housing, said piston reciprocable within a cylinder bore to define a variable volume combustion chamber;
 - an oil sump disposed within said engine housing and containing oil;
 - a camshaft rotatably supported within said engine housing in timed driven relationship with said crankshaft, said camshaft translatable axially between first and second positions, said camshaft further comprising:
 - at least one cam lobe periodically engaging a valve; and
 - at least one auxiliary valve actuator axially spaced from said cam lobe, said auxiliary valve actuator engaging said valve in said first camshaft position and not engaging said valve in said second camshaft position; and
 - an oil pump in fluid communication with said oil sump, oil pressure generated by said oil pump acting upon at least a portion of said camshaft to translate said camshaft from said first position to said second position at high engine speeds, said oil pressure insufficient at low engine speeds to translate said camshaft from said first position to said second position.
2. The engine of Claim 1, wherein said oil pump is separate from said camshaft, said oil pump in fluid communication with at least a portion of said camshaft via an oil supply passage.
3. The engine of Claim 1, wherein said oil pump comprises an oil pump member mounted on said camshaft, said oil pump member rotatable with said camshaft to generate said oil pressure.
4. The engine of Claim 3, wherein said oil pump member comprises an impeller including a body portion, said impeller generating oil pressure upon rotation of said camshaft which acts upon said body portion.

5. The engine of Claim 3, wherein said camshaft is rotatably supported at opposite ends thereof within first and second bearings carried by said engine housing, said first bearing in fluid communication with said pump member.

6. The engine of Claim 5, wherein said camshaft further comprises a longitudinal bore therethrough, said bore fluidly communicating said first and second bearings with one another, said oil pump member pumping oil from said first bearing to said second bearing through said bore.

7. The engine of Claim 1, wherein in said first camshaft position, said at least one auxiliary valve actuator engages said valve during a compression stroke of said piston to open said valve and vent pressure from said combustion chamber.

8. The engine of Claim 1, wherein in said first camshaft position, said at least one auxiliary valve actuator engages said valve during an expansion stroke of said piston to open said valve and allow entry of fluid into said combustion chamber.

9. The engine of Claim 1, wherein said camshaft includes a pair of said auxiliary valve actuators, wherein in said first camshaft position, one of said auxiliary valve actuators engages said valve during a compression stroke of said piston to open said valve and vent pressure from said combustion chamber and the other of said auxiliary valve actuators engages said valve during an expansion stroke of said piston to open said valve and allow entry of fluid into said combustion chamber.

10. The engine of Claim 1, further comprising a spring disposed between said engine housing and said camshaft, said spring biasing said camshaft to said first position.

11. An internal combustion engine, comprising:
an engine housing containing an oil sump having a volume of oil, said engine housing further including a cavity in fluid communication with said oil sump;
a crankshaft, connecting rod, and piston assembly disposed within said engine housing, said piston reciprocable within a cylinder bore to define a variable volume combustion chamber;

a camshaft rotatably supported in said engine housing in timed driven relationship with said crankshaft, said camshaft translatable axially between a first position and a second position, said camshaft further comprising:

at least one cam lobe periodically engaging a valve;

an auxiliary valve actuator axially spaced from said cam lobe, said auxiliary valve actuator engaging said valve in said first camshaft position and not engaging said valve in said second camshaft position; and

an oil pump member rotatably disposed within said cavity, oil pressure generated by said oil pump member acting upon said oil pump member at high engine speeds to translate said camshaft from said first position to said second position.

12. The engine of Claim 11, wherein said oil pump member comprises an impeller including a body portion and a plurality of impeller blades extending from said body portion.

13. The engine of Claim 11, wherein said camshaft is rotatably supported in first and second bearings carried by said engine housing, said first bearing in fluid communication with said cavity.

14. The engine of Claim 13, wherein said camshaft further comprises a longitudinal bore therethrough which fluidly communicates said first bearing with said second bearing, said oil pump member pumping oil through said bore to said second bearing upon rotation of said camshaft.

15. The engine of Claim 11, wherein in said first camshaft position, said at least one auxiliary valve actuator engages said valve during one of a compression stroke and an expansion stroke of said piston to open said valve and vent pressure said combustion chamber.

16. The engine of Claim 11, further comprising a spring disposed between said engine housing and said camshaft, said spring biasing said camshaft to said first position.

17. An internal combustion engine, comprising:
an engine housing;

a crankshaft, connecting rod, and piston assembly disposed within said engine housing, said piston reciprocable within a cylinder bore to define a variable volume combustion chamber;

an oil sump disposed within said engine housing and containing oil;

a camshaft rotatably supported within said engine housing in timed driven relationship with said crankshaft, said camshaft translatable axially between first and second positions, said camshaft further comprising:

at least one valve actuator periodically engaging a valve; and

at least one auxiliary valve actuator spaced from said valve actuator, said auxiliary valve actuator engaging said valve in said first camshaft position and not engaging said valve in said second camshaft position; and

means for translating said camshaft between said first and second positions responsive to engine speeds.

18. The engine of Claim 17, wherein said means for translating said camshaft comprises an oil pump member connected to said camshaft and rotatable therewith.

19. The engine of Claim 17, wherein said means for translating said camshaft further comprises means for biasing said camshaft to said first position.

20. The engine of Claim 17, wherein said auxiliary valve actuator comprises a release member which, in said first camshaft position, engages and opens said valve during one of a compression stroke and a vacuum stroke of said piston to vent said combustion chamber.

21. The engine of Claim 17, wherein said auxiliary valve actuator comprises a low oil shutdown member which, in said first camshaft position, engages and opens said valve to vent said combustion chamber.

22. An internal combustion engine, comprising:

an engine housing;

a crankshaft, connecting rod, and piston assembly disposed within said engine housing, said piston reciprocable within a cylinder bore to define a variable volume combustion chamber;

an oil sump disposed within said engine housing and containing oil;
a camshaft rotatably supported within said engine housing in timed driven relationship with said crankshaft, said camshaft translatable axially between first and second positions, said camshaft further comprising:

at least one low speed cam lobe periodically engaging a valve in said first camshaft position; and

at least one high speed cam lobe periodically engaging said valve in said second camshaft position; and

an oil pump disposed within said engine housing in fluid communication with said oil sump, oil pressure generated by said oil pump acting upon at least a portion of said camshaft to translate said camshaft from said first position to said second position at high engine speeds, said oil pressure insufficient at low engine speeds to translate said camshaft from said first position to said second position.

23. The engine of Claim 22, wherein said oil pump is separate from said camshaft, said oil pump in fluid communication with at least a portion of said camshaft via an oil supply passage.

24. The engine of Claim 22, wherein said oil pump comprises an oil pump member mounted on said camshaft, said oil pump member rotatable with said camshaft to generate said oil pressure.

25. A method of operating an internal combustion engine having a camshaft with at least one cam lobe actuating at least one valve, comprising the step of:

translating the camshaft axially responsive to oil pressure between a first position in which an auxiliary valve actuator on the camshaft engages a valve and a second position in which the auxiliary valve actuator does not engage the valve.